Listing of the Claims

1. (Currently Amended) A system for generating cine images of a continuously moving bodily structure, the apparatus comprising:

a magnetic resonance imager ~~(10)~~ which generates magnetic resonance image data of a bodily structure of a subject in an examination region ~~(12)~~ as the subject bodily structure moves continuously through a continuous series of motion states;

a means ~~(38, 40, 72)~~ for providing indications of current motion states through which the bodily structure is moving; and,

a distributing means ~~(42)~~ for distributing the magnetic resonance data in accordance with the detected current motion states.

2. (Currently Amended) The apparatus according to claim 1, wherein the distributing means ~~(42)~~ distributes the magnetic resonance data among a plurality of motion state windows and further including:

a sequence controller ~~(30)~~ which cause the magnetic resonance imager ~~(10)~~ to generate phase encoded data with each of a plurality of preselected phase encoding steps within each of the motion state windows as the bodily structure moves continuously back and forth through the motion states.

3. (Currently Amended) The apparatus according to claim 2, further including:

a reconstruction means ~~(50)~~ for reconstructing the magnetic resonance data corresponding to each motion state window into an image representation;

a cine means ~~(58)~~ for presenting the image representations in a cine mode such that images displayed on a monitor ~~(56)~~ depict continuous movement of the bodily structure.

4. (Currently Amended) The apparatus according to claim 3, further including:

a means ~~(74)~~ for signaling to the sequence controller each time the bodily structure moves into a next motion state window.

5. (Currently Amended) The apparatus according to claim 3, further including:

a memory ~~(46)~~ for providing an indication to the sequence controller of the phase encode steps for which data has already been collected corresponding to each motion state window.

6. (Currently Amended) The apparatus according to claim 3, wherein the distributing means ~~(42)~~ distributes the data with a near central phase encoding into a single motion state window and data with high phase encodings into a plurality of motion state windows.

7. (Currently Amended) The apparatus according to claim 3 wherein the distributing means ~~(42)~~ distributes the data with near central phase encoding into narrower motion state windows than data with higher phase encoding.

8. (Currently Amended) The apparatus according to claim 1, wherein the bodily structure is a joint and further including:

a kinematic joint device ~~(14)~~ which constrains motion of the joint to a selected trajectory.

9. (Currently Amended) The apparatus according to claim 8, further including:

a means ~~(70, 72)~~ for moving the kinetic joint device ~~(14)~~ continuously along the trajectory.

10. (Currently Amended) The apparatus according to claim 9, wherein the sequence controller ~~(30)~~ controls the means ~~(70, 72)~~ for moving the kinematic point device ~~(14)~~.

11. (Original) A method for generating cine images of a continuously moving bodily structure, the method comprising:

continuously moving the bodily structure back and forth through a series of motion states;

generating magnetic resonance image data of the bodily structure as it moves continuously through the motion states;

detecting current motion states through which the bodily structure is moving; and,

distributing the magnetic resonance data in accordance with the detected current motion states.

12. (Original) The method according to claim 11 wherein the data is distributed among a plurality of motion state windows, and further including:

generating phase encoded data with each of a plurality of preselected phase encodings within each of the motion state windows.

13. (Original) The method according to claim 12, further including:

reconstructing the magnetic resonance data corresponding to each motion state window into an image representation;

displaying the image representations in a cine mode such that the image display depicts continuous movement of the bodily structure.

14. (Original) The method according to claim 12, wherein determining the current motion state includes one of:

generating navigator echoes;

optically imaging the continuously moving bodily structure; and,

monitoring a position a portion of a kinematic device connected with the bodily structure.

15. (Original) The method according to claim 12, further including:

updating a record of the phase encoding with which data has been collected corresponding to each motion state window.

16. (Original) The method according to claim 13, further including:

generating low resolution reference data for each motion state window with a plurality of antennae;

using the reference data as a regularization image to improve conditioning of an inversion matrix for each of a plurality of the motion states for unfolding aliased images collected in parallel from the plurality of antennae during the continuous motion through the motion states;

using the reference data in conjunction with the image data from the continuously moving bodily structure to reconstruct the cine mode image representations.

17. (Original) The method according to claim 13, further including:

generating the image data from a center of k-space progressively outward;

repeatedly reconstructing the image data such that the cine mode image display improves as more data is collected;

stopping the generating of image data after the cine mode image display becomes satisfactory.

18. (Original) The method according to claim 12, wherein the data is distributed at least one of:

with near central phase encodings into a single motion state window and data with high phase encodings duplicated and shared among a plurality of phase encode windows;

with data with nearer central phase encoding sorted among narrower motion state windows than data with higher phase encoding; and

into progressively narrower motion state windows as additional image data is generated.

19. (Original) The method according to claim 11 wherein the bodily structure is a joint and further including:

mechanically constraining the joint to move back and forth along a selected trajectory.

20. (Original) The method according to claim 19 wherein each motion state window corresponds to an equal portion of the trajectory.

21. (Currently Amended) A computer program for programming a magnetic resonance imager ~~(10)~~ to generate cine images of a bodily structure which is continuously moving back and forth through a series of motion states by performing the steps of:

generating magnetic resonance image data of the bodily structure as it moves continuously through the motion states;

detecting current motion states through which the bodily structure is moving; and,

distributing the magnetic resonance data in accordance with the detected current motion states.